Abstract

A system, method, and apparatus select state variables for, build state equations of, and simulate time-domain operation of an electronic circuit. The circuit is modeled with three branch types (inductor, resistor, voltage source in series; capacitor, resistor, current source in parallel; and switch), including four pre-defined switch types (unidirectional unlatched, bidirectional unlatched, unidirectional latched, and bidirectional latched). Automated analyses determine efficient state variables based on the currently active circuit topology, and state equations are built and applied. Switching logic determines when switch states change, and state equations for the new topology are either drawn from a cache (if the topology has already been processed) or derived anew. The switch control signals may be combined into a single switching variable, defined as a function of the state output.